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QUANTLOGIC CORPORATION
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EXAMINER

JONAITIS, JUSTIN M

ART UNIT	PAPER NUMBER
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3752

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/597,000	Applicant(s) HOU, DEYANG	
	Examiner JUSTIN JONAITIS	Art Unit 3752	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☒ Claim(s) 11-13, & 19 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 April 2008 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the fuel passages (of claim 1 and 17) and the other multi-hole conventional orifice (of claim 23) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claims 11-13 and 19 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claims 3-6, 17, & 18. See MPEP § 608.01(n). Accordingly, the claims 11-13, & 19 have been treated on the merits in view of claim 1.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 23 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically it's not clear what the other multi-hole conventional orifice is referring to.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1,3-5, 17, & 19-20 rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent #4,350,301 to Erwin et al.

In re claim 1, Erwin et al. discloses a fuel injector comprising:

- A nozzle body (upper and lower cylindrical portions (52) & (54)) comprising passages for fuel (passage (104)), an inner cylindrical space (Cavity (78)) for receiving a needle valve (Stem (86) of valve needle), and a conical surface (conforming seat (112)) close to the tip of the nozzle body for guiding a spray of fuel;

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- A needle valve, which has a converging-diverging conical head (conically shaped poppet valve (110)) for guiding a spray of fuel and which is movable back and forth and received in the nozzle body, wherein the needle valve is at a biased closing position or an opening position defined by driving means (piston (72)); and
- A micro-variable –circular orifice (variable area orifice (88)), comprising a variable circular ring aperture between the needle valve and the nozzle body.
- Such that fuel is dischargeable in variable sprays of conical and conical-multi-jet shapes through the variable circular orifice by lifting the needle valve at different magnitudes.

In re claim 3, Erwin et al. discloses the invention as described above including the conical surface has a single conical surface (conforming seat (112))

In re claim 4, Erwin et al. discloses the invention as described above including the conical surface is an integrated conical surface having two or more conical surfaces with different conical angles connected together (conforming seat (112) and walls of outlet bore (66)).

In re claim 5, Erwin et al. discloses the invention as described above including the conical surface being a diverging curved surface.

In re claim 17, Erwin et al. discloses the invention as described above including the fuel channel between the needle valve and nozzle body is of converging-diverging shape and by lifting the needle valve at different magnitudes, the minimum cross-section is at the sealing

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surface during the early stage of fuel injection, the minimum cross-section is at the variable orifice, and the minimum cross-section is at the sealing surface again during the late stage of the fuel injection, whereby it has means of ensuring fine atomization during all fuel injection stages.

In re claim 19, Erwin et al. discloses the invention as described above including the fuel injected is diesel fuel.

In re claim 20, Erwin et al. discloses the invention as described above including the valve needle is passively driven by high fuel pressure which provides said driving means [column 5, Lines 33-61].

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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9. Claims 2, 6-16, 18, & 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent #4,350,301 to Erwin et al.

In re claim 2, Erwin et al. discloses the invention as described above in the first embodiment (Erwin et al. Figure 2, however the first embodiment fails to disclose a plurality of micro-channels.

Erwin et al. however teaches in a second embodiment (Erwin et al. Figure 5) that it is known to include channels (orifices (132)) on the variable orifice. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the outlet orifice of the first embodiment of Erwin et al. with the outlet orifice (including the plurality of channels) of the second embodiment of Erwin et al. since such modification would vary the spray pattern

In re claims 6, 9-12, and 18, Erwin et al. discloses the invention as described above but fails to disclose specific dimensions of the components.

It would have been obvious to one having ordinary skill in the art at time the invention was made to select the proper dimensions of components in order to achieve the desired spray pattern and invention size, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art.

In re claim 7, Erwin et al. discloses the invention as described above but fails to disclose the plurality of micro channels on the conical surface with cross sections that are semi-circles, arcs, triangles, trapezoids, or other polygons.

It would have been obvious to one having ordinary skill in the art at the time the invention was made that the shape of the claimed channels would have been an obvious matter of design

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choice. Please note that in the instant application applicant has not disclosed any criticality for the claimed limitation.

In re claim 8, Erwin et al. discloses the invention as described above including the needle head remaining at least partially received within the tip as the needle valve is moved back and forth between the biased closing position and the opening position such that the fuel is injected through the variable aperture between the needle head and the conical surface of the nozzle body, and fuel is also injected through the multiple channels, the upper surface of the needle head and the conical surface serve as guiding surfaces for fuel sprays [column 7, line 47 - column 9, line 6]

In re claim 13, Erwin et al. discloses the invention as described above, in the second embodiment, including the channels being distributed under the conical surface (conical region at the top of lower bore(64)) so that they are open or closed channels (depending on the location of valve needle head).

In re claim 14, Erwin et al. discloses the invention as described above, in the second embodiment, including the channels being underneath the conical surface (conical region at the top of the lower bore (64)) , forming a valve-covered-orifice multi-hole type injector through blocking the circular aperture by the needle head (pintle(134)) at a predefined needle-lift range.

In re claims 15 and 16, Erwin et al. discloses the invention as described above including different shapes of fuel spray being generated by changing the magnitude of lift of the needle valve (arranged in the nozzle body) so that at low to medium injection loads, fuel is mainly

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injected through the variable circular aperture between the needle head and nozzle body, thus mainly forming a conical shape spray, while at high injection loads, the needle head partially blocks the variable circular aperture and fuel is injected through both the variable circular aperture and the channels, thus forming a mixed-mode conical-multi-jet shape spray whereby provides different atomization desired by engine combustion at different loads. [column 7, line 47 - column 8, line 46]

In re claims 21 and 22, Erwin et al. discloses the invention as described above but fails to disclose the device being actively driven by an actuator such as a solenoid or piezo actuator which provides said driving means.

Official Notice is taken that solenoids and piezo actuators are a conventional or well-known feature of method of actively actuating a fuel injector. Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a solenoid or piezo actuator to control the fluid distribution of the fuel injector.

In re claim 23, Erwin et al. discloses the invention as described above including the variable circular orifice having a variable circular ring aperture and multiple channels wherein the circular orifice can be used as a sole orifice at a specific discharge pressure.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent #3,042,317 to Simmons discloses a fuel injector with similar structures. U.S. Patent #4,030,668 to Kiwior discloses a fuel injector with similar structure. U.S. Patent #4,129,254 to Bader, Jr. et al. discloses a fuel injector with similar structure and components.

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U.S. Patent #4,219,154 to Luscomb discloses a fuel injector with similar structures and components. U.S. Patent #4,487,369 to Du Rocher discloses a fuel injector with similar spray variation. U.S. Patent #4,923,169 to Grieb et al. discloses a fuel injector with a dual conical surface connected to each other. U.S. Patent #7,051,958 to Potz et al. discloses a fuel injector with similar structure and components.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JUSTIN JONAITIS whose telephone number is (571)270-5150. The examiner can normally be reached on Monday - Thurs 6:30am - 5:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Len Tran can be reached on (571)272-1184. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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